

## WEST Search History

DATE: Monday, May 19, 2003

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*DB=USPT,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ*

L5	ascorbic.clm. and microorganisms and ((435/\$)!.COR.) and gulonic	11	L5
L4	ascorbic.clm. and microorganisms and ((435/\$)!.COR.)	84	L4
L3	L2 and microorganism.clm.	5	L3
L2	L1 and ascorbic.ti.	198	L2
L1	ascorbic.clm.	2994	L1

END OF SEARCH HISTORY

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
196 04 798 A1	August 1997	DE	
WO97/43433	November 1999	WO	

## OTHER PUBLICATIONS

Ogawa, et al., "Microbial enzymes: new industrial applications from traditional screening methods," TIBTECH, vol. 17, pp. 13-20 (1999).

Kobayashi, et al., "Lactone-ring-cleaving enzyme: Genetic analysis, novel RNA editing, and evolutionary implications," Proc. Natl. Acad. Sci. USA, vol. 95, pp. 12787-12792 (1998).

Bublitz, et al., "The role of aldonolactonase in the conversion of L-gulonate to L-ascorbate," Biochimica et Biophysica, vol. 47, pp. 288-297 (1961).

Derwent English language abstract of De 196 04 798 A1 (document B2).

Zachariou, et al., "Glucose-Fructose Oxidoreductase, a New Enzyme Isolated from Zymomonas mobilis That is Responsible for Sorbitol Production," Journal of Bacteriology, 167(3): 863-869 (1986).

Hucho, et al., "Glucono-.delta.-Lactonase From Escherichia Coli," Biochimica et Biophysica Acta, 276:176-179 (1982).

Shimizu, et al., "Purification and Characterization of a Novel Lactonohydrolase, Catalyzing the Hydrolysis of Aldonate Lactones and Aromatic Lactones, from Fusarium oxysporum," Eur. J. Biochem., 209:383-390 (1992).

Kanagasundaram, et al., "Isolation and Characterization of the gene encoding gluconolactonase from Zymomonas mobilis," Biochimica et Biophysica Acta, 1171: (1992).

ART-UNIT: 161

PRIMARY-EXAMINER: Lilling; Herbert J.

## ABSTRACT:

A process for producing L-ascorbic acid (vitamin C) from 2-keto-L-gulonic acid or D-erythorbic acid from 2-keto-D-gluconic acid by contacting 2-keto-L-gulonic acid or 2-keto-D-gluconic acid, respectively, in solution with a lactonase, particularly one belonging to the enzyme class EC 3.1.1.x, according to the classification of Enzyme Nomenclature. The solvent for this reaction can be water, an aqueous alcohol, a non-alcoholic organic solvent or a mixture of an aqueous alcohol and a non-alcoholic organic solvent. The contacting is generally performed in a temperature range of 0.degree. C. to 120.degree. C. and a pH range of 1.5 to 12. In each case the starting material can be in the form of the free acid, the sodium salt, or the calcium salt. The so-produced vitamin C has very well known uses, and the alternatively produced D-erythorbic acid is useful as an antioxidant for food additives.

15 Claims, 0 Drawing figures

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- ☐ 1. [6420419](#). 11 Jun 98; 16 Jul 02. L-ascorbic acid 2-phosphate zinc salt and process for manufacturing the same. Suzuki; Masahiro, et al. 514/474; 549/477 549/479 549/497. A61K031/341 C07D307/33.
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- ☐ 2. [6346257](#). 04 Nov 99; 12 Feb 02. Process for preparing water-in-oil type emulsion cosmetic composition containing L-ascorbic acid with improved stability. Lee; Hun Jin, et al. 424/401; 514/474. A61K007/00.
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- ☐ 3. [6287611](#). 01 Feb 00; 11 Sep 01. Beverage having L-ascorbic acid with stability of color and clarity. Morello; Michael J., et al. 426/72; 426/262 426/271 426/590. A23L002/00 A23L001/302.
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- ☐ 4. [6274744](#). 17 Oct 00; 14 Aug 01. Preparation of alkali metal salts of L-ascorbic acid. Burst; Wolfram, et al. 549/315;. C07D307/62.
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- ☐ 5. [6271397](#). 07 Jun 99; 07 Aug 01. L-ascorbic acid-2-phosphoric acid potassium crystal and method for producing the same. Oomori; Kazuhiro, et al. 549/222; 549/218. C07F009/06.
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- ☐ 6. [6197977](#). 20 Apr 00; 06 Mar 01. Process for the preparation of L-ascorbic acid. Bottcher; Andreas, et al. 549/315;. C07D307/62.
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- ☐ 7. [6146860](#). 18 Jan 00; 14 Nov 00. Manufacture of L-ascorbic acid and D-erythorbic acid. Asakura; Akira, et al. 435/126; 435/137 435/195 435/196 435/197. C12P017/04 C12N009/18.
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- ☐ 8. [5998634](#). 15 Mar 99; 07 Dec 99. One-step synthesis of vitamin-C (L-ascorbic acid). Murphy; Andrew P., et al. 549/315;. C07D307/62.
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- ☐ 9. [5916915](#). 04 Jun 98; 29 Jun 99. Water-in-stable L-ascorbic acid derivative and a method for preparation thereof, and a skin-whitening cosmetic composition containing the same. Hong; Jong Eon, et al. 514/474; 514/374 514/844 548/339.1 549/222 549/315 549/316. A61K031/34 C07D307/26.
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- ☐ 10. [5902885](#). 08 Jan 93; 11 May 99. Production of L-ascorbic acid. Takanohashi; Kunio, et al. 549/315;. C07D307/62.
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- ☐ 11. [5817238](#). 13 Mar 97; 06 Oct 98. Process for producing purified L-ascorbic acid. Makino; Kaoru, et al. 210/659; 210/198.2. B01D015/08.
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- ☐ 12. [5637734](#). 03 Nov 95; 10 Jun 97. Process for producing L-ascorbic acid. Honda; Haruomi, et al. 549/315;. C07D307/62.
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- ☐ 13. [5521090](#). 10 Feb 94; 28 May 96. L-ascorbic acid containing biomass of chlorella pyrenoidosa. Doncheck; James A., et al. 435/257.3; 435/137 435/138 435/946. C12N001/12 C12N015/00 C12P007/58 C12P007/60.
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- ☐ 14. [5110951](#). 25 Jun 90; 05 May 92. Method for producing L-ascorbic acid 2-phosphates.

Ishimura; Yoshimasa, et al. 549/222;. C07F009/06.

☐ 15. 5001059. 01 Jul 85; 19 Mar 91. L-ascorbic acid production in microorganisms. Skatrud; Thomas J., et al. 435/137; 435/138 435/257.3 435/946. C12P007/58 C12P007/60 C12N001/12 C12N015/00.

☐ 16. 4999437. 01 Mar 90; 12 Mar 91. Preparation of ascorbic acid 2-phosphate and of 5, 6-isopropylideneascorbic acid and potassium magnesium l-ascorbate 2-phosphate as an advantageous salt of l-ascorbic acid 2- phosphate. Dobler; Walter, et al. 549/222; 549/221 549/315. C07F009/06.

☐ 17. 4778902. 01 Jul 86; 18 Oct 88. Method of purifying L-ascorbic acid. Fujiwara; Yoshitaka, et al. 549/315;. C07D307/62.

☐ 18. 4767870. 01 Jul 86; 30 Aug 88. Method of purifying L-ascorbic acid. Fujiwara; Yoshitaka, et al. 549/315;. C07D307/62.

☐ 19. 4724262. 01 Aug 86; 09 Feb 88. Process for purifying L-ascorbic acid 2-phosphate. Shimbo; Kuniaki, et al. 549/222; 987/58. C07F009/12.

☐ 20. 4491668. 23 Mar 83; 01 Jan 85. Process for preparing L-ascorbic acid. Ikawa; Kenji, et al. 549/315;. C07D307/62.

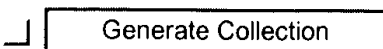
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Terms	Documents
l-ascorbic.clm. and l-ascorbic.ti.	24

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L9: Entry 2 of 3

File: EPAB

Feb 27, 2002

DOCUMENT-IDENTIFIER: EP 1182262 A1

TITLE: Microbial production of l-ascorbic acid and d-erythorbic acidAbstract Text (1):

CHG DATE=20020403 STATUS=O> A process for producing L-ascorbic acid or D-erythorbic acid or in each case its sodium, potassium or calcium salt, from 2-keto-L-gulonic acid or 2-keto-D-gluconic acid or in each case its sodium, potassium or calcium salt, involves incubating 2-keto-L-gulonic acid or 2-keto-D-gluconic acid, each as the free acid or as its sodium, potassium or calcium salt, and cells of a thermoacidophilic microorganism at temperatures from about 30 DEG C to about 100 DEG C and at a pH from about 1 to about 6 in a solution to form L-ascorbic acid or D-erythorbic acid or an appropriate salt thereof, and isolating said product from the solution. L-Ascorbic acid (vitamin C) is widely used not only in health care as such but also in food, animal feed, e.g. fish feed, and cosmetics. D-erythorbic acid is mainly used as an antioxidant for food additives.

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☐ 1. [6358715](#). 04 Dec 98; 19 Mar 02. Production of ascorbic acid. Kumar; Manoj. 435/138; 435/135 435/136 435/143 435/171 435/252.3 435/252.4. C12P007/62 C12P007/40 C12P007/60 C12P007/50.

☐ 2. [EP 1182262 A1](#). 16 Aug 01. 27 Feb 02. Microbial production of l-ascorbic acid and d-erythorbic acid. ASAKURA, AKIRA, et al. C12P017/04; C12N001/20.

☐ 3. [KR 2002015982 A](#) [EP 1182262 A1](#) [AU 200163544 A](#) [CA 2355298 A1](#) [NO 200104082 A](#) [BR 200103639 A](#) [JP 2002101895 A](#) [CN 1351171 A](#). Production of L-ascorbic acid and D-erythorbic acid or their salts from 2-keto-L-gulonic acid and 2-keto-D-gluconic acid respectively, comprises incubating the substrates and cells of a thermoacidophilic microorganism in solution. ASAKURA, A, et al. C12N001/00 C12N001/20 C12N001/21 C12P007/58 C12P017/04 C12N001/20 C12R001:01 C12P017/04 C12R001:01.

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Terms	Documents
L8 and I2 and I1	3

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- ☐ 1. 6541228. 28 Nov 00; 01 Apr 03. Electrodialysis methods for purification and recovery of gluconic acid derivatives. Genders; J. David, et al. 435/126; 204/518 204/522 204/530 204/536 204/537 210/638 210/641 210/654 210/659 435/136 435/137 435/138 435/139 435/146 435/173.2. B01D015/04 B01D061/42 C12P007/40 C12P007/58 C12P007/60.
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- ☐ 2. 6387654. 04 May 00; 14 May 02. Bacterial strains and fermentation processes for the production of 2-keto-L-gulonic acid. Liaw; Hungming J., et al. 435/42; 435/126 435/136. C12P039/00 C12P017/04 C12P007/40.
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- ☐ 3. 6358715. 04 Dec 98; 19 Mar 02. Production of ascorbic acid. Kumar; Manoj. 435/138; 435/135 435/136 435/143 435/171 435/252.3 435/252.4. C12P007/62 C12P007/40 C12P007/60 C12P007/50.
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- ☐ 4. 6316231. 10 Sep 99; 13 Nov 01. Bacterial strains for the production of 2-keto-L-gulonic acid. Stoddard; Steven F., et al. 435/138; 435/252.1. C12P007/60 C12N001/20.
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- ☐ 7. 5834231. 24 Oct 96; 10 Nov 98. Bacterial strains and use thereof in fermentation process for 2-keto-L-gulonic acid production. Stoddard; Steven F., et al. 435/42; 435/126 435/136 435/137 435/138 435/252.1. C12P017/04 C12P007/58 C12P007/60 C12P039/00.
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- ☐ 8. 5817490. 25 Apr 97; 06 Oct 98. Enzymatic process for the manufacture of ascorbic acid 2-keto-L-gulonic acid and esters of 2-keto-L-gulonic acid. Hubbs; John Clark. 435/137; 435/195 435/197 435/219 435/252.3 435/836 435/847 435/913 435/921 435/933 536/23.2. C12P007/58 C12N009/14 C12N001/20 C12N001/00.
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- ☐ 9. 5312741. 08 Jun 92; 17 May 94. Process for producing 2-keto-L-gulonic acid. Hoshino; Tatsuo, et al. 435/42; 435/138 435/822 435/823. C12P007/60 C12P039/00 C12N001/20 C12R001/38.
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- ☐ 10. 4758514. 14 Jun 84; 19 Jul 88. Ascorbic acid intermediates and process enzymes. Light; David R., et al. 435/91.41; 435/143 435/190 435/252.3 435/252.31 435/252.33 435/320.1 536/23.2 930/240. C12P019/34 C12P007/50 C12N015/00 C12N009/04.
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- ☐ 11. 4259443. 12 Jun 79; 31 Mar 81. Synthesis of ascorbic acid from lactose. Danehy; James P.. 435/137; 435/138 435/190. C12N009/04 C12P007/58 C12P007/60.
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